# Document details





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## CFD Simulation on the Hydrodynamics in Gas-Liquid Airlift Reactor (Article)

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### Abstract

View references (37)

Two-fluid model approach to simulate gas-liquid airlift reactors is widely implemented but have yet to reach a consensus on the closure model to account the gas-liquid interphase forces. Proper selection of a closure model is required in order to accurately capture the hydrodynamics in the complex of the two-phase system. Our work concerns the evaluation of the interfacial forces models (i. e. drag, lift and turbulent dispersion force) and their effects on local gas holdup and liquid velocity. A transient three-dimensional airlift reactor simulation was carried out using computational fluid dynamics by implementing the dispersed standard k-ϵ turbulence model. Four drag models governed by spherical bubble, bubble deformation and Rayleigh-Taylor were being evaluated in our work. The significance on the inclusion of the lift model on predictive accuracy on the flow field was also studied as well. Whereas, two turbulent dispersion force models were selected to evaluate on their performance in improving the predictive accuracy of the local hydrodynamics. Results showed that the drag governed by Rayleigh-Taylor which accounts the bubble swarm effect had better predictions on the gas holdup in the downcomer and improved predictions in radial gas holdup. The inclusion of the lift model improved local gas holdup predictions at higher heights of the reactor and shifted the bubble plume towards the centre region of the riser. Meanwhile, the turbulent dispersion models improved the overall results of predicted local gas holdup with closer agreement obtained when the drift velocity model was considered in the simulation. The axial liquid velocity was well predicted for all cases. The consideration of the drag, lift and turbulent dispersion forces resulted in a closer agreement with experimental data. 

### Author keywords

airlift reactor | computational fluid dynamics | gas-liquid | interfacial forces | two-way coupling